



## From 2G to 4G: LTE Facilitating Technology Leapfrog

As 2G operators witness the ramp up of data traffic on 3G networks, a move straight to 4G looks promising.

Third-generation networks have been in the ground for nearly a decade, but only recently have operators begun to experience a dramatic ramp up of mobile broadband services. As a result, many operators running 2G systems in regions from the Middle East and Africa to Asia and the Americas have limited spending on 3G systems, waiting for mobile broadband growth.

Today, mobile data is indeed growing at an exponential rate thanks to falling prices, mobile-based applications such as video, wider spread deployments of 3G networks and mobile data-enabled devices such as smartphones and laptops. Third generation networks are now present in more than 90 countries.

Informa Telecoms & Media predicts mobile broadband subscribers will represent nearly one third of total mobile subscribers worldwide by 2013. The firm said mobile broadband subscribers jumped 84 percent to 186 million at the end of 2008 compared with 101 million at the end of 2007.

Still, in some areas in Asia, for instance, just 15 percent of mobile subscribers are currently connected to 3G services, with the majority of users concentrated in developed markets like Singapore, Japan, Hong Kong, Korea and Australia, according to Informa. In the Middle East and Africa, operators, which have secured 3G spectrum but haven't rolled out commercially, have been waiting for demand to show up, said Tom Gruba, senior director of wireless broadband product marketing with Motorola.

As these operators begin to see the data wave come to their regions, they find themselves in a unique position: Do they launch 3G services or leapfrog that generation entirely and move on to 4G Long Term Evolution (LTE) networks?

In addition, there are plenty of other operators who have just begun their 3G rollouts and still have some amount of open spectrum in their 3G spectrum bands. For these operators, who might be just sparking the acceleration of data demand today, at what point should they slow down their 3G deployments and begin deployment of a higher capacity LTE network in remaining 3G carriers?

Rick Mostaert, director of LTE product management with Motorola, said many reasons exist as to why 2G operators and 3G operators just beginning deployments should consider moving more quickly to LTE. LTE is an all-IP technology that promises to deliver an unrivaled user experience with ultra-fast mobile broadband, a lower cost of delivering data and very low latency services by 2010.

While new technology is typically expensive, mobile operators around the world are moving at an unprecedented rate to deploy the next generation of networks, driving down the economies of scale.

ABI Research says that more than 18 wireless operators that have decided to deploy LTE will continue to invest in base stations, despite a poor economic environment. The research firm estimates that operators will spend more than \$8.6 billion on LTE base station infrastructure by 2013.

Infonetics Research believes LTE will be deployed rapidly and that its infrastructure market alone should reach \$5 billion in 2013.

"If providers carry out their LTE plan as scheduled, the first technical deployments of LTE will take place in the second half of 2009, and the market will be primed to grow quickly," noted Stephane Teral, principal analyst for mobile and fixed-mobile communications infrastructure with Infonetics.

In the United States, Verizon Wireless has an aggressive timetable for deploying LTE, launching select markets in late 2009, with rapid deployments coming in 2010. Likewise, NTT DoCoMo in Japan and China Mobile have their sights on early and

aggressive deployments. Even regional players such as MetroPCS and CenturyTel, which plan to target rural customers, in America are planning a migration to LTE.

Pyramid Research predicts that LTE networks will support more than 100 million subscribers in just four years, thanks to the widespread vendor and operator support. It took six years for 3G networks to hit the 100-million subscriber mark.

The firm said one major factor that will contribute to this strong growth rate is cost. While LTE networks will cost billions, their IP-based architecture will reduce network costs overall. In addition, LTE networks have an estimated average sector throughput of up to 52 Mbps, allowing for large areas of coverage that can support high data rate applications such as high-definition video streaming at a lower cost per bit.

While peak network data rates are often cited by vendors (e.g. 42 Mbps for HSPA+ compared to over 100 Mbps for LTE), the average sector throughput is much more important for determining cost per bit and network performance as operators consider the realistic throughput seen by users over the entire coverage area of a cell. Using average sector throughput as the measure, LTE can provide four times the throughput of 3G given the same amount of spectrum, but can scale to 10 to 15 times the throughput using a full 20 MHz of spectrum (given the most advanced antenna techniques for LTE are used).

Cost is a major consideration, Gruba said. "While mobile broadband uptake is increasing exponentially thanks to flat-rate data plans, that increase does not necessarily correspond to an equivalent increase in data revenue or profit," he said. Data from Hutchison 3 UK reveals that while its mobile network data traffic increased at a rate of six to 14 times a year from 2007 and on, the revenue made on that traffic only increased 10 to 30 percent on a yearly basis .

"The flat IP architecture and OFDM-based radio technology offered by LTE makes it efficient enough to meet the growing mass-market requirements of a DSL-equivalent wireless broadband service," Mostaert said. "LTE allows an operator to deliver broadband at a lower cost per bit."

Perhaps even more compelling to 2G operators is LTE technology's spectrum flexibility. Mostaert said operators can deploy the technology alongside their GSM networks within existing spectrum – offering both voice and broadband – because LTE is designed to work in as little as a 1.4-megahertz swathe of spectrum. This allows operators to grow the network as demand for data services grow. W-CDMA networks, the 3G evolution path for GSM operators, introduce a completely new air interface that requires 5 megahertz of open spectrum to operate. CDMA networks can evolve to 3G using the same basic air interface at the radio, but won't be able to support the massive growth in mobile data that is expected going forward.

Moreover, LTE will appear in a number of different spectrum bands around the world, including refarmed GSM bands in the 900 MHz and 1800 MHz bands in Europe.

Operators around the world of all types have seen great success with their 2G voice systems and they can continue to invest in those networks. “2G is a long-term viable solution to support voice and enable roaming for the three to four billion subscribers of mobile voice service,” said Mostaert. “We may even see 2G continue in operation while 4G replaces the data services of 3G. The future five to 10 years from now might consist mostly of 2G plus LTE networks.”

“LTE is a cost-effective solution for broadband, whether that is rural broadband access or fixed-line access alternative,” Gruba said. “It can be the tool that allows a 2G operator to target the mass-market consumer with broadband services, and in some cases, displacing fixed broadband operators in particular regions.”

Second-generation operators will also have the opportunity to transform themselves into a total communications provider, offering a one-stop-shop of fixed, mobile and Internet solutions across their markets. Because LTE is an all-IP technology, LTE can interconnect and handover between technologies such as WiFi and DSL. Such a fixed-mobile convergence strategy offers 2G operators the chance to quickly recover their deployment costs, Gruba said.

In the end, said Gruba, 2G operators will have to weigh the viability and return on investment of new 3G networks for low cost, flat-fee based services—the proven way operators are growing mobile data services.

“Mobile operators around the world have seen that as they move to flat-rate pricing, demand for mobile broadband explodes along with the pressure on network capacity and cost,” Gruba said. “For operators that have not made the leap to 3G, LTE may very well be the best bet to profit the most from mobile broadband.”

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